

Claims

What is claimed is:

- 1 1. A silicon-containing resist composition, said composition comprising
2 (a) an acid-sensitive imaging polymer,
3 (b) a radiation-sensitive acid generator, and
4 (c) a non-polymeric silicon additive.
- 1 2. The resist composition of claim 1 wherein said imaging polymer contains
2 a monomer selected from the group consisting of a cyclic olefin, an
3 acrylate and a methacrylate.
- 1 3. The resist composition of claim 1 wherein said imaging polymer contains
2 fluorine moieties.
- 1 4. The resist composition of claim 1 wherein said composition contains at
2 least about 5 wt.% silicon based on weight of said imaging polymer.
- 1 5. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive contains at least about 10 carbon atoms.
- 1 6. The resist composition of claim 1 wherein said imaging polymer contains
2 silicon.
- 1 7. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive contains acid labile moieties that inhibit solubility of said
3 composition in aqueous alkaline solutions.
- 1 8. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive contains at least two silicon-containing moieties.

- 1 9. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive contains at least one ring structure.
- 1 10. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive has a weight average molecular weight of less than 3000 and a
3 sublimation temperature or boiling point of at least 150°C.
- 1 11. A method of forming a patterned material structure on a substrate, said
2 material being selected from the group consisting of semiconductors,
3 ceramics and metals, said method comprising:
4 (A) providing a substrate with a layer of said material,
5 (B) forming a planarizing layer over said material layer,
6 (C) applying a resist composition over said planarizing layer to form a
7 resist layer, said resist composition comprising:
8 (a) an acid-sensitive imaging polymer,
9 (b) a radiation-sensitive acid generator, and
10 (c) a non-polymeric silicon additive.
11 (D) patternwise exposing said substrate to radiation whereby acid is
12 generated by said radiation-sensitive acid generator in exposed
13 regions of said resist layer by said radiation,
14 (E) contacting said substrate with an aqueous alkaline developer
15 solution, whereby said exposed regions of said resist layer are
16 selectively dissolved by said developer solution to reveal a
17 patterned resist structure,

- 18 (F) transferring resist structure pattern to said planarizing layer, by
19 etching into said planarizing layer through spaces in said resist
20 structure pattern, and
- 18 (G) transferring said structure pattern to said material layer, by etching
19 into said material layer through spaces in said planarizing layer
20 pattern.
- 1 12. The method of claim 11 wherein said etching of step (G) comprises
2 reactive ion etching.
- 1 13. The method of claim 11 wherein said radiation has a wavelength of about
2 193 nm.
- 1 14. The method of claim 11 wherein said substrate is baked between steps
2 (D) and (E).
- 1 15. The method of claim 11 wherein said imaging polymer contains a
2 monomer selected from the group consisting of a cyclic olefin, an
3 acrylate and a methacrylate.
- 1 16. The method of claim 11 wherein said imaging polymer contains fluorine
2 moieties.
- 1 17. The method of claim 11 wherein said composition contains at least about
2 5 wt.% silicon based on weight of said imaging polymer.

- 1 18. The method of claim 11 wherein said non-polymeric silicon additive
2 contains at least about 10 carbon atoms.
- 1 19. The method of claim 18 wherein said imaging polymer contains
2 silicon.
- 1 20. The method of claim 11 wherein said non-polymeric silicon additive
2 contains acid labile moieties that inhibit solubility of said composition in
3 aqueous alkaline solutions.